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taining 1 megaspore; larger spore-bodies (sporocarps) globose, containing many stalked sporangia which each contain several masses of microspores. (Greek *azo* = to dry, *ollupi* = to kill; referring to the rapid death when taken from water.) We have only the following species.

1. *AZOLLA CAROLINIANA* Willd. (Pl. 21, f. 2.)

Plants $\frac{1}{4}$ –1 inch long, reddish or greenish; sporocarps in the leaf axils. Cuticle of megaspore finely granulate. —British Columbia to Ontario, south to Florida and Mexico.

UNIVERSITY OF WASHINGTON, SEATTLE, WASH.

**Ferns and their allies in Southern Franklin County,
Maine.**

CLARENCE H. KNOWLTON

Franklin County lies in western Maine, reaching from Canton, Rome, and Vienna, some 85 miles northwest to the Province of Quebec. It has an area of 1,764 square miles, about one-third larger than Rhode Island, or one-fifth the size of Vermont. It includes within its limits part of the Rangeley Lakes and most of the Sandy River valley. Of its 48 townships only about half are organized, and these occupy the southern portion of the county. The unorganized townships are covered with forests, mostly of the type called "Canadian," but there is also much hard wood.

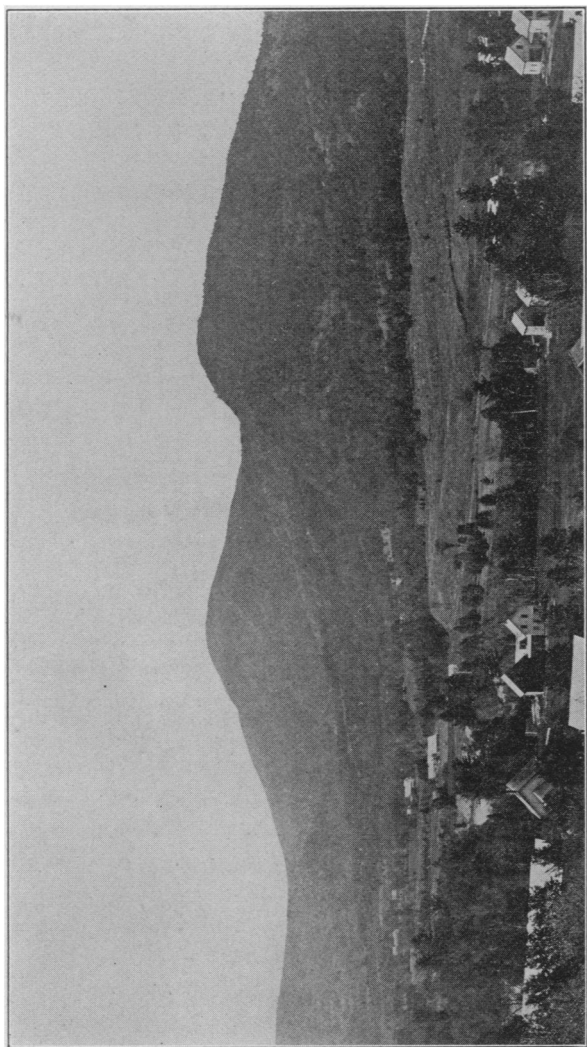
My own acquaintance has been largely with the settled parts of the county, especially the region around my old home at Farmington, where I did my first fern collecting. Extensive collections of ferns have also been made in this region by Messrs. H. W. Jewell and A. H. Trundy, of Farmington, Miss L. O. Eaton, of Chesterville, and

Miss Kate Furbish, of Brunswick. This article sums up their work, as well as my own.

Polypodium vulgare L. is abundant in many places, and seems to like granitic rocks especially. In general the fronds are regular, but Mr. Jewell has found specimens of var. *auritum* Willd. *Phegopteris polypodioides* Fée is very common in moist open woods, while *P. Dryopteris* (L.) Fée is more often found in deeper woods. It was many years before I found the third species of the genus, *P. hexagonoptera* (Michx.) Fée. There are only four stations for it even yet, two in Farmington (H. W. Jewell), one in Chesterville (Miss Eaton), and the fine large stand which I found in open woods in Strong. It is decidedly a rare fern. *Adiantum pedatum* L. is very abundant in the rich humus of deciduous woods, and I have seen it flourishing in clearings and pastures where the woods have been removed. *Pteris aquilina* L. is exceedingly common in pastures and dry upland white birch woods.

When I made my first botanical visit to Chesterville, the southernmost town of the county, I invaded one of the peat-bogs, and was surprised and delighted to find a big fern growing there in abundance. Some of the fronds were five feet tall. This proved to be *Woodwardia virginica* (L.) Sm., and I have since found one more station for it, in the same town, at least sixty miles back from the present coast line.

Asplenium acrostichoides Sw. is very luxuriant in rich deciduous woods, while *A. filix-foemina* (L.) Bernh. flourishes in moist situations everywhere. *A. Trichomanes* L. is found only on moist ledges of Day Mt., in Strong and Avon, above an altitude of 1,000 feet, on the shaded side of the mountain. The specimens here are numerous and well developed, the best I have ever seen, some of the fronds at least 2.5 dm. in length. It is very different from the starveling specimens I



DAY MOUNTAIN

have usually found in other places. *A. platyneuron* (L.) Oakes I never expected to see in Farmington, but Mr. Jewell finally discovered two lonely plants crouching beside a granite boulder in a large pasture. It is occasional in similar places twenty-five miles to the south in Kennebec and Androscoggin Counties, but here it seems to be out of range.

Polystichum acrostichoides (Michx.) Schott is common. Its incised variety seems to be caused, in some instances, by abnormal light exposure. I have found good specimens only in woods stripped of foliage by insects, and in recent clearings. The beautiful holly fern *P. Braunii* (Spenner) Fée was first found by Mr. Jewell at the foot of Day Mt., in Strong and Temple, but I have since found larger quantities of it at an elevation above 800 feet in the adjoining town of New Vineyard. Not only does it flourish in the rich rocky woods, but it has also persisted for many years in an adjacent pasture, where it is closely cropped by the cattle.

Of the genus *Aspidium*, *A. Thelypteris* (L.) Sw. and *A. noveboracense* (L.) Sw. are very common. *A. marginale* (L.) Sw. abounds in rocky woods, and I have one specimen of var. *elegans* J. Robinson, which grew on a glacial terrace near the river in Farmington. *A. Goldianum* Hook. is a very rare species, but very well developed in the three stations where it flourishes. It is far too large to make good herbarium specimens. *A. Boottii* Tuckerm. was first called to my attention by Miss Eaton, at Chesterville, but later I found it flourishing in rich wet woods at Farmington. It is one of our rare ferns. *A. cristatum* (L.) Sw. is frequent in wet open woods and swamps, but its variety *Clin-tonianum* D. C. Eaton, is very rare. I have not found it myself, but Messrs. Jewell and Trundy have found a few specimens. *A. spinulosum* (O. F. Müller) Sw. occurs frequently, while its beautiful variety *intermedium*

(Muhl.) D. C. Eaton is the most abundant fern of the deep woods. Above 1,200 feet elevation on the hilltops and mountain sides there is abundance of the very broad variety *dilatatum* (Hoffm.) Gray, forma *anadenium* Robinson. Nothing in the so-called "Canadian forest" is more beautiful than a mountain glade filled with this large but delicate fern.

Both species of *Cystopteris* are present, but they are not widely distributed. *Woodsia ilvensis* (L.) R. Br. is abundant on dry ledges in Strong, Wilton, and Chesterville, perhaps elsewhere. *Dicksonia* and *Onoclea sensibilis* L. are our two most common species in dry and moist soil. The latter, when cut with the grass in July, frequently develops later an anomalous frond which is best described as variety *obtusilobata* (Schkuhr) Torr. It is only a seasonal form. All along the intervals, and frequently on moist uplands, this species flourishes, and repeated frosts seem to have no effect on its roots. *O. Struthiopteris* (L.) Hoffm. is everywhere in the alluvium along the Sandy River, and occasionally on the higher land.

Of the Osmundaceae, all three species are abundant, but *Osmunda cinnamomea* L. is the most flourishing. Variety *frondosa* Gray and var. *incisa*, J. W. Huntington, have been detected by Mr. Jewell, but they are very far from common.

Ophioglossum vulgatum L. I have found several times, usually in dryish soil. It seems to like the shade of *Pteris*, and it is probably not rare, but it is so slender that it is frequently overlooked.

The other genus of this order, *Botrychium*, is well represented, both by species and by individuals. The little moonwort with the long name, *B. lanceolatum* (Gmel.) Ångstroem, var. *angustisegmentum* Pease & Moore is the rarest one, and I have found it in only three places in wet woods. *B. ramosum* (Roth) Aschers

is occasional in dry woods. *B. obliquum* Muhl. is very abundant, and variety *dissectum* (Spreng.) Clute is not difficult to find. *B. ternatum* (Thunb.) Sw., var. *intermedium* D. C. Eaton is also very common, but var. *rutaefolium* (A. Br.) D. C. Eaton is rare, and rather indefinite. These leathery fronds are almost evergreen, and in late fall it is very interesting to walk across pastures and old fields, looking for the numerous variations in size and outline of the sterile fronds. The other species, *B. virginianum* (L.) Sw. is common in rich deciduous woods.

In *Equisetum* there is abundance of *E. arvense* L., *E. sylvaticum* L. and *E. fluviatile* L. Along the wooded terraces of the river there is a great deal of the scouring rush, *E. hyemale* L., var. *affine* (Engelm.) A. A. Eaton, much prized in the olden time under its vernacular name. *E. scirpoides* Michx. is occasional in cold evergreen woods, often near brooks. Until the past year I had not found *E. litorale* Kühlewein. Then I found it in wet gravel along the Sandy River at New Sharon, with no fruit.

Franklin County seems to be a paradise for *Lycopodium*. *L. lucidulum* Michx. flourishes in rich woods, *L. inundatum* L. in clayey fields and meadows. *L. annotinum* L. likes dry woods, and on the summits of the higher mountains there are several stations for the almost prickly var. *pungens* Desv. *L. clavatum* L. and var. *megastachyon* Fernald & Bissell flourish in the upland pastures. *L. obscurum* L. and var. *dendroideum* (Michx.) D. C. Eaton are also frequent in woods, pastures, and old fields. *L. sabinaefolium* Willd. I first found at Ft. Kent, in Aroostook County. When I returned to Farmington I had the agreeable surprise of finding several stations there, one of them five minutes' walk from home. Other collectors have doubtless had similar experiences. *L. complanatum* L. I have not

found in Franklin County myself, but Miss Furbish once collected it in Strong, and it ought to flourish in the northern woods. Its variety *flabelliforme* Fernald is the most common *Lycopodium* of all. Last but not least is the very distinct *L. tristachyum* Pursh, its blue green foliage and deep running rootstocks furnishing two ready means of field determination. It seems to like a rather firm dry soil in the open.

I have never detected any Selaginellas in the county, and but one kind of *Isoetes*, *I. echinospora* Dur., var. *Braunii* (Dur.) Engelm. This flourishes in the bottom of slow-moving streams, especially the Sandy River and its tributaries.

The following summary shows in brief the number of ferns and fern-allies I have mentioned.

	<i>Species</i>	<i>Varieties</i>
Polypodiaceae.....	26	7
Osmundaceae.....	3	2
Ophioglossaceae.....	4	4
Equisetaceae.....	6	1
Lycopodiaceae.....	8	4
Isoetaceae.....	1	—
	—	—
	47	19

Those botanists who have collected elsewhere in northern New England will miss several species from the foregoing list. As only about a third of the 48 townships in Franklin County have been explored botanically, it is not for me to say that such plants as *Pellaea atropurpurea* do not grow within its limits. If there is any limestone area in the unexplored sections, it is more than possible that there are several other species. Further than this, there are such quantities of fern vegetation everywhere in woods, pastures, and

swamps, that every opportunity is afforded for those enthusiasts who are interested in formal variations. I have found it a most interesting region, and I hope it may be visited by other fern collectors.

HINGHAM, MASS.

Ferns Collected in the Noyo River Canyon, Mendocino Co., Calif., Aug. 10-14.

H. H. TRACY

Botrychium silaifolium Presl.

Polypodium vulgare L.

“ *falcatum* Kellogg.

Gymnopteris triangularis (Kaulf) Underw.

Adiantum pedatum L.

Struthiopteris spicant (L) Scop.

Woodwardia radicans (L) Sm.

Asplenium cyclosorum Rupr.

Dryopteris nevadensis (Eat) Underw.

“ *rigida* var. *arguta* (Kaulf) Underw.

Polystichum munitum (Kaulf) Underw. Castella.

“ *californicum* (D. C. Eaton) Underw.

“ *aculeatum* (Swz) Roth.

Azolla filiculoides Lam.

IN THE REGION OF MT. SHASTA, CAL., AUG. 19-23.

Pteridium aquilinum var. *pubescens*. Castella.

Cryptogramma acrostichoides R. Br. Castle Lake.

Pellaea brachyptera (Moore) Baker. Castella.

“ *densa*. Castella.

Asplenium cyclosorum Rupr. . Castella.

Polystichum californicum (Eaton) Underw. Trail to Mt. Eddy.

“ *munitum* (Kaulf.) Underw. Castella.

“ *Lemmonii* Underw. Trail to Mt. Eddy.

“ *Lonchitis* (L.) Roth. Castle Lake.